CHAPTER 5 - WET WEATHER NEEDS

INTRODUCTION

Wet weather events are known to cause a variety of water quality problems throughout the nation. Under various circumstances, precipitation in the form of snow or rain generates runoff that can be contaminated by a variety of pollutant sources (industrial operations, roadways, various land use practices). The runoff might contain numerous pollutants (metals, nutrients, bacteria, suspended solids, bacteria, biochemical oxygen demand) at levels of concern. Usually, these pollutants end up in surface waters such as rivers or lakes. Intense storm water runoff can also cause the flooding of open stream channels, overload existing storm sewers, infiltrate sanitary sewers, and overload pumping stations and wastewater treatment facilities. Wet weather results in urban runoff, much of which is regulated by the NPDES Storm Water Program (Category VI Needs). Some urban runoff from smaller urbanized areas is considered to be nonpoint source pollution (Category VII-D Needs).

Where combined sewer systems exist, wet weather contributes to combined sewer overflows, or CSOs (Category V Needs). CSOs contain not only storm water but also untreated human and industrial waste, toxic materials, and debris. These materials can be a major water pollution concern for cities with combined sewer systems. CSOs are among the major sources responsible for beach closings, shellfishing restrictions, and other waterbody impairments in areas served by combined sewer systems. The EPA CSO Control Policy calls for communities with combined sewer systems to implement nine minimum controls and to develop long-term control plans (LTCPs) to meet water quality standards.

Sanitary sewer overflows (SSOs) can be caused by inappropriate sewer collection system design or management or by lack of adequate operation and maintenance. These overflows pose a substantial health and environmental challenge in some parts of the United States. A sanitary sewer overflow can spill untreated sewage out of manholes and onto city streets and playgrounds and into storm sewer systems and streams. Because SSOs contain raw sewage, they carry bacteria, viruses, protozoa (parasitic organisms), helminth (intestinal worms), and other disease-causing organisms. Many of the problems responsible for SSOs can be addressed through Needs Category III.

COMBINED SEWER OVERFLOWS (CATEGORY V NEEDS)

Summary of CSO Needs Estimation Approach

This section describes the main features of the combined sewer overflow (CSO) estimating methodology used in the 1992 Needs Survey and the 1996 Clean Water Needs Survey (CWNS). The only change in the methodology since the 1996 CWNS is the replacement of the model that was previously used to estimate CSO costs when different cost data are not available with a CSO cost curve. Documented needs remain the primary objective for obtaining Category V needs. EPA will be assessing state's progress on implementing the CSO policy by evaluating CSOs that are not under LTCPs.

Background

The 1992 Needs Survey included several objectives for estimating the costs of meeting the needs of CSO controls. These objectives were maintained and enhanced to provide the basis of the 1996 CWNS CSO estimates. The 1996 objectives were improving statistical information on CSOs, determining the Category V Needs (CSO needs submitted by the States based on CSO abatement plans developed in response to their interpretation of meeting Clean Water Act and water quality standards requirements), and providing an estimate for nationwide CSO control based on EPA's CSO Control Policy.

In 1994 EPA issued the Final CSO Control Policy, which contained provisions for developing site-specific NPDES permit requirements for all combined sewer systems that overflow as a result of wet weather. The CSO portion of the 1996 CWNS was based on the CSO Control Policy presumption approach criteria, requiring *"The elimination or the capture for treatment of no less than 85 % by volume of the combined sewage collected in the CSS during precipitation events on a systemwide annual average basis."* A cost-estimating methodology was developed that approximated these requirements by estimating control costs for primary clarification and disinfection (chlorination/dechlorination) of 85 percent of the annual system-wide runoff volume of each CSO community. The presumption approach, though not the solution for all CSO communities, will continue to provide the technical basis for the national CSO control estimate. Table 5-1 provides a summary of key 1996 CWNS CSO results.

Table 5-1. Summary of 1996 Clean Water Needs Survey CSO Results

Category of CSO Needs	Total Number	Needs Total
Estimated CSO control needs	---	$44.7 billion
Total CSO facilities	880	---
Total CSO facilities with Needs Allocations	869	$15.3 billion
Independent facilities	717	$29.5 billion
Cost curve facilities	683	$29.4 billion
Total documented needs	266	$15.3 billion
Total cost curve needs	683	$29.4 billion
Category V Needs (Separate State Estimates)	---	$5.2 billion

Summary of 1996 CWNS CSO Cost-estimating Methodology

Acquisition and Organization of Data on CSO Facilities

Information on CSO facilities was collected using the CSO portion (Screen C) of the EPA Needs Survey database. A "facility" is the basic data collection unit in the CWNS database, and each facility represents an existing or proposed treatment plant or part of a particular service area within a treatment authority. Many of the facilities listed in the CWNS database are collection facilities integrated into larger systems with centralized treatment works. To estimate CSO needs, it was necessary to treat all the facilities in each of these systems as a single unit. A "system" is defined as all the facilities discharging to a central treatment works. In estimating CSO needs, several treatment systems without CSOs were integrated into systems with CSOs to account for their treatment capacity.

$$\log(CSPOP) = 1.4464 + 0.8297 \times \log(CSAREA)$$

The key parameters used to estimate CSO needs are combined sewer population (CSPOP) and combined sewer area (CSAREA), which are the total population and area served by a facility. How these data were used in the 1996 CWNS CSO methodology is discussed below. Several facilities contained data on either CSPOP or CSAREA but not both. For the purposes of estimating needs, a regression analysis was performed (Equation 1) to estimate CSPOP or CSAREA for single-facility systems for which one or the other piece of information was not in the database.

Rainfall Analysis

One objective of the 1996 CWNS was to enhance the estimation of the size and cost of the additional capacity required at each CSO treatment facility such that 85 percent of annual runoff volume would receive adequate treatment. To estimate a national CSO control cost, each community's estimate was based on the additional facilities required to adequately treat the runoff from a design rainfall rate found to correspond to 85 percent annual capture.

The goal of the rainfall analysis was to determine the 85 percent capture design storm for each CSO community. It is generally accepted that the depth of a chosen rainfall event is proportional to the logarithm of the event's return period. Thus, it was assumed that a community's 85 percent capture design storm could be determined from two of its design storms. For each of the database communities, the 1-year, 6-hour and 5-year, 6-hour storm depths were interpolated from National Weather Service TP-40 design storm contour maps.

An analysis of 20 years of rainfall data at 20 representative locations across the country was undertaken to determine the relationship between the 85% capture design storm and statistical design storms. Given differences in regional rainfall patterns, the 20 locations were divided into six rainfall regions, and a different 85 percent capture design storm/statistical design storm relationship was determined for each region. For each of the 20 representative rainfall locations, the 85 percent capture design storm was determined by an analysis of 20 years of hourly rainfall data. Each hour's rainfall in effect represents an average rainfall rate (inches/hour) over that hour. By ranking all non-zero hourly rainfall rates and selecting the 85th percentile value, the 85 percent capture design storm was identified.

A regression was performed for each region on the 1-year, 5-year, and 85 percent capture design storms of that region's representative locations. The results of the regressions were best-fit function coefficients (so-called rainfall constants $\mathbf{k_1}$, $\mathbf{k_2}$, and $\mathbf{k_3}$), allowing the 85 percent capture design storm of any CSO community to be determined given its region and its 1-year, 6-hour and 5-year, 6-hour design storm rainfall depths.

CSO Overflow Volume Calculation

The assumption was made that primary clarification and disinfection with storage/sedimentation basins would provide CSO abatement. A typical design criterion for sedimentation basins is a hydraulic overflow rate of 1,000 gpd/ft^2 on an average basis. This flow rate results in a 2-hour detention time if a sidewater depth of 11.2 ft is assumed. (A depth of 10 to 12 ft is typical.) For treatment of CSOs, a peak flow rate of 2.5 times the average rate was assumed, resulting in detention times of 48 min (0.8 hr). To link runoff flow rate to rainfall rate, without modeling each system's catchments, it was assumed that all rain falling at the same time would reach a system's treatment facility simultaneously. This meant that the runoff rate at the treatment facility would be identical to the rainfall rate multiplied by the system's area and runoff coefficient.

After determining the 85 percent capture design storm (rainfall rate) for each CSO community in the database, needs were calculated by estimating the cost of new primary clarification and disinfection facilities required to adequately treat the 48-minute runoff volume from the 85 percent capture design storm. The 48-minute runoff volume was determined using the 85 percent capture rainfall rate, combined sewer area, and runoff coefficient (Equation 2). Runoff coefficients were estimated as a function of imperviousness, which itself was determined as a function of combined sewer area population density.

CSO Facility Cost Calculations

For each CSO community, the existing peak primary treatment capacity was assumed to be 150 percent of the treatment plant's design flow rate. This 48-min volume (flow * 48 min) was subtracted from the 48-min runoff volume to determine the net volume requiring new facilities. As part of the 1992 Needs Survey, unit costs for sedimentation tanks and disinfection facilities were obtained from the literature (Equations 3 and 4). A 35 percent contingency and engineering cost was added to the estimated unit construction costs. The largest feasible sedimentation facility was assumed to have a basin volume of 20 million gallons. If a greater volume than this was necessary, costs were calculated for multiple facilities.

Regression Cost Calculations

In cases where neither combined sewer population nor combined sewer area was available, CSO needs were estimated by regression analysis. A relationship was developed relating community population and CSO needs based on estimated needs for facilities with population and area data (Equation 5). Using community populations, this relationship was applied to estimate CSO needs where necessary.

Original (1992) Needs Survey CSO Equations

$$\log(CSPOP) = 1.4464 + 0.8297 \times \log(CSAREA) \qquad \textbf{(1)}$$

$$RV = (0.05 + (0.9 \times I)) \times RAIN85 \times CSAREA \times \frac{1}{36.84} \qquad \textbf{(2)}$$

$$COST_{sed} = 1.35 \times VOL^{0.821} \qquad \textbf{(3)}$$

$$COST_{dis} = 1.35 \times 0.219 \times FLOW^{0.496} \tag{4}$$

$$COST_{reg} = 7.46 + RPOP \times 0.000611 \tag{5}$$

1996 CWNS Modifications

The CSO cost-estimating methodology for the 1996 CWNS remained largely the same as it was in 1992. The main area of improvement anticipated for 1996 was an increase in data collection efforts. The cost-estimating methodology relied on certain data provided by the contractor (e.g., rainfall), and data that were requested from all CSO communities (e.g., combined sewer area and population) but in many cases were not provided. It was determined that for 169 systems, the database did not contain adequate information to estimate needs using the methods summarized previously. For these systems needs were estimated based on information consistently available for all systems. This information consisted of a population of some form: the population receiving collection, the population receiving treatment, the CSO population, or if necessary a population determined from Census data. The resulting CSO needs were estimated using a regression analysis that approximated a linear relationship between need and the best available data for community population. The total for systems with needs estimated through the regression analysis was $3.3 billion. Other improvements were included in the following discussion.

Survey of Large CSO Communities

Approximately 60 percent of the total CSO Need is attributable to 113 CSO systems with populations of more than 100,000. Several of the largest CSO communities, based on population and estimated need, were targeted to provide current information on combined sewer area (CSAREA) and population (CSPOP), a description of existing CSO control measure(s), the relationship between central treatment plant and contributing facilities, and peak treatment rate. This effort helped to eliminate gaps in the CWNS database.

Expanded Rainfall Analysis

The 1992 rainfall data were probably not sufficient to accurately develop the relationships used to determine rainfall for individual CSO locations. This is particularly true on a regional basis. The East and Midwest, which contain 90 percent of the nation's CSO communities, had only 12 rainfall locations. The rainfall analysis for the 1996 CWNS CSO analysis was expanded from 20 to 50 sites.

Inclusion of Pumping and Interceptors Costs

Costs for pumping and interceptors were included in the 1996 survey methodology.

Estimating Approach for Small Cities

Approximately 60 percent of all CSO systems (representing 12 percent of the total CSO control cost) are made up of communities with populations of less than 10,000 people. The per capita CSO control cost for the 216 systems with populations of less than 2,000 is $4,700. Because construction cost may be less in rural areas (smaller communities), the 1996 estimate included an adjustment for cost based on the regional ENR Construction Cost Index.

Modification of EPA Database Screen C

In 1992 estimates were originally developed for a range of CSO control goals, including nine minimum controls; storage and treatment of the 3-month, 6-hour and 1-year, 6-hour design storms; and meeting water quality standards. As a result, Screen C had requested certain data that were not required in the 1996 CWNS. The 1996 CWNS version of Screen C was modified to request only the data required for the presumption approach estimate.

Methodology on EPA Mainframe

For the 1996 CWNS the estimating methodology was made available to the States. This enabled communities to update their estimates.

CHANGES TO CSO ESTIMATION APPROACH FOR CWNS 2000

During the 1996 CWNS a cost curve was developed that was based on the original 1992 Needs Survey with the incorporation of the enhancements described above. Using the cost curve, costs were estimated for all individual CSO facilities in communities with CSO needs that were unable to fully document their costs of meeting CSO Control Policy objectives.

The following data, related to combined sewers, are recorded in the CWNS database (see Chapter 5 of the *CWNS 2000 Database User Guide*):

- CSO status
- Documented area (acres) and population
- Cost curve area (acres) and population

If a facility has a Present and/or Projected Nature of Collection: Combined Sewers, it must have a CSO Status assigned. The CSO Status defines the source of the CSO correction needs data (documented, cost curve, both documented and cost curve, neither) for the facility. Table 5-2 presents the availability of data elements to store data. The Area Acres and Population data describe the acreage of the combined sewer service area for this facility and the associated collection population, as they relate to either the documented or cost curve generated needs. The cost curve area and population are used in the CSO cost curve equations.

Table 5-2. CSO Status and Associated Data Requirements

Selected CSO Status:	Documented Area & Pop	Cost Curve Area & Pop	Documented CSO Needs	CSO Cost Curve
No Needs; Problem Solved	No	No	No	No
Documented Needs Only	Enabled	No	Required	No
Requires a Cost Curve	No	Enabled/Reqd.	No	Required
Both Documented and Cost Curve Needs	Enabled	Enabled/Reqd.	Required	Required

Examples of acceptable documentation include Long-Term Control Plans and related engineering studies (see Chapter 3 for details). It should be noted that CSO communities have a need unless a state certifies that the community cannot meet water quality standards by implementing CSO control. Also, EPA wants to emphasize that documented needs remain the primary objective for obtaining Category V needs and that the Agency will be assessing state's progress on implementing the CSO policy by evaluating CSOs that are not under LTCPs.

STORM WATER CONTROLS (CATEGORY VI NEEDS)

Introduction

Pollutants from many sources of storm water discharges remain largely uncontrolled. When providing input to the biennial National Water Quality Inventories, many states have repeatedly cited diffuse sources of water pollution as the leading cause of water quality impairment. In developing Inventories, States have identified a number of major classes of diffuse sources of pollution, including separate storm sewers, urban runoff, construction, waste disposal, and resource extraction, which correlate well with categories of discharges covered by the NPDES storm water program. Although many studies characterize these sources as diffuse or nonpoint sources of pollution, most urban and construction site runoff is discharged via separate storm sewers and, therefore, under the Clean Water Act (CWA), is a point source discharge.

Numerous studies have shown that storm water from residential and commercial areas can contain a variety of pollutants, including heavy metals, pathogens (often indicated by fecal coliform or *Escherichia coli*), pesticides, suspended solids, nutrients, and floatables. Runoff from industrial facilities can contain additional pollutants depending on the nature of industrial activity such as material management and waste disposal practices and activities that disturb soils. Other studies have shown that many storm sewers also receive illicit discharges of untreated non-storm water discharges and spills, as well as large amounts of wastes that have been improperly managed and disposed of, particularly used oils. Removal of non-storm water discharges to storm sewers can present opportunities for dramatic improvements in the quality of storm water discharges.

NPDES Storm Water Regulatory Program

Section 405 of the Water Quality Act of 1987 (WQA) added section 402(p) to the CWA, which required EPA to develop a phased approach to regulating storm water discharges under the National Pollutant Discharge Elimination System (NPDES) program. A "large municipal separate storm sewer system" is a system serving a population of 250,000 or more. A "medium municipal separate storm sewer system" is a system serving a population of 100,000 or more, but less than 250,000. These municipal systems include separate storm sewers of four types:

- Located in a city having a separate storm sewer system serving a population of 100,000 or more.
- Located in a county identified by EPA as having large populations in unincorporated, urbanized areas where the separate storm sewer system serves a population of 100,000 or more.

- Designated by the Director of the NPDES program (EPA region or State) as part of the large or medium system due to the interrelationship with the large or medium systems described above.
- Located within the boundaries of a region defined by a storm water management regional authority, and designated by the Director of the NPDES program as part of a large or medium system.

EPA promulgated the Storm Water Phase II Rule on October 29, 1999. It expanded the requirements for obtaining storm water NPDES permits to all municipal separate storm water systems (MS4s) serving a population of less than 100,000 down to MS4s in urbanized areas with a population density of 1,000 per square mile. The Phase II regulatory approach is similar to that of Phase I, which requires the establishment of municipal storm water management programs. Essentially, this approach continues to rely on best management practices and provides municipalities with the flexibility to decide what these practices and combinations of practices should be in order to emphasize the storm water needs of their communities. The regulation requires that the municipal programs be composed of six minimum control measures, including

- Public Education and Outreach
- Public Involvement and Participation
- Illicit Detection and Elimination
- Construction Site Water Runoff Control
- Post construction Storm water Management
- Pollution

Prevention and Good Housekeeping for Municipal Operations

The CWA provided that EPA or authorized NPDES States may issue system-wide or jurisdiction-wide permits covering all discharges from a municipal separate storm sewer system. The CWA also requires that NPDES permits for discharges from municipal separate storm sewer systems include both a requirement to effectively prohibit non-storm water discharges into the storm sewers and controls to reduce the discharge of pollutants to the maximum extent practicable (MEP). Although the CWA did not explicitly define the controls necessary to achieve MEP, they include management practices; control techniques; system, design, and engineering methods; and other provisions appropriate for the control of storm water pollutants.

Regulations for the municipal component of the storm water program are codified at 40 CFR 122.26. They require NPDES permits for discharges from municipal separate storm sewer systems to effectively detect and remove illicit discharges and improper discharges and disposal. In certain instances, the most appropriate option for achieving this requirement is for the municipality to ensure that the illicit discharger obtains an NPDES permit for the discharge. In most cases, however, elimination of illicit connections or improper dumping is the most appropriate focus of this program component. It should be emphasized that inner-city core areas, particularly in the parts of the country that were settled earliest, have an opportunity to benefit greatly from this program component because implementing a prohibition on illicit discharges and improper dumping often has positive results on the quality of storm water.

CWNS 2000 APPROACH FOR CATEGORY VI NEEDS

Overview of Determining Documented Category VI Needs

The *1996 Needs Survey Report to Congress* included approximately $7.4 billion in modeled storm water program needs and $3.2 billion in documented storm water control needs (for 21 states). The modeled estimate of Storm Water Program needs represented only the estimated SRF-eligible portion of the costs that are expected to develop and implement a Storm water Management Program in response to the Phase I Storm Water Program Regulations. The storm water needs for municipalities that will now be covered under the Phase II requirements were included in Category VIID - Urban Runoff Needs in the 1996 Needs Survey. Those needs totaled approximately $1.0 billion for five States. In the 1996 Needs Survey, the CWNS States estimated Category VI Needs based on the ***documented*** costs to private parties of SRF-eligible structural and nonstructural controls, as well as program development and implementation costs. ***Since recent EPA policy has indicated that there are limitations on SRF eligibility once an NPDES storm water permit has been issued and the intent of the Category VI data collection effort in the 2000 CWNS is to determine the costs of addressing permitted storm water discharges, Category VI needs should include only storm water control needs for municipal facilities that have been issued NPDES storm water permits.***

SOURCES AND LIMITATIONS OF STORM WATER DOCUMENTATION

The SRF-eligible portions of the NPDES storm water permit program consist of capital costs for developing and implementing municipal storm water management programs. As of December 31, 1999, only approximately 20 municipal Phase I storm water permits remain to be issued (populations of >100,000) for discharges from their municipal separate storm sewer systems. Storm water flows from unregulated areas, or from areas regulated under the industrial storm water program, are not SRF-eligible until the storm water enters the municipal system.

One of the objectives of the 2000 CWNS Category VI effort will be to estimate the "magnitude" costs of Phase I jurisdictions focusing on the nonrecurring 3-year capital costs for program development and implementation. Another objective of the 2000 CWNS storm water effort is to allow the data to be dis-aggregated to provide the opportunity to estimate state-level and large-watershed-scale costs for storm water management. This achievement would be an important incremental step in EPA's ability to evaluate storm water, along with other wet weather issues, in a comprehensive, integrated manner.

A variety of sources of acceptable documentation are available in the Phase I NPDES municipal permits. These include reports from storm water utilities, capital improvement programs (CIPs), and others. The detailed information in the municipal storm water management program proposed in the Part 2 permit applications must be definitive for it to be a need. Comparable construction costs can be applied to other needs.

The distinction between continuing implementation versus one-time capital costs is an important one when addressing wet weather flow issues. This is particularly true for certain ongoing pollution prevention activities. For example, street sweeping includes programmatic, capital, operation, and maintenance expenditures. It is not precisely clear where the distinctions are between program, equipment, operation, and maintenance. A case-by-case evaluation of the documentation submitted will be necessary to determine need and cost in these instances. Furthermore, the Clean Water State Revolving Fund Framework, issued in October 1996, states that "All SRF projects must be 'capital' type projects, such as constructing treatment facilities, planting trees and shrubs, purchasing equipment, and environmental clean-ups. The SRF cannot fund operations and maintenance cost of sewage treatment facilities or general O&M costs such as staff salaries and fuel for equipment that are outside the scope of a project."

Another example of how the evaluation of documentation will be necessary to determine Category VI Needs and costs is erosion and sediment (E&S) control from construction site runoff that discharges to a municipal separate storm sewer system. Expenditures for establishing the program and for the training of inspectors and other activities are programmatic capital costs. However, most costs for capital E&S control equipment are borne by developers (and are subject to the Industrial component of the NPDES Storm water Program). Municipal E&S inspectors are responsible for ensuring proper operation and maintenance of the private (or public) E&S controls. In some instances, the municipality might need to perform maintenance as part of handling an emergency situation and may recover some costs through performance bonding. An argument could be made that this type of E&S control expense by a municipality is a programmatic capital expenditure.

An unresolved issue is whether the capitalization period of 20 years (used for traditional needs) should be used for storm water controls. Information will continue to be evaluated relevant to the failure of wet weather controls (possibly due to their periodic/intermittent use) to determine whether a 10-year capitalization period is more appropriate for storm water controls.

SUBMITTING DOCUMENTATION FOR CATEGORY VI NEEDS

During the 1996 Needs Survey several kinds of documentation were approved for documenting storm water needs, including municipal CIPs, NPDES storm water permit applications, mandated State storm water programs, and State storm water surveys. Past experience evaluating storm water documentation indicates that these sources of documentation vary widely in the degree and quality of available information. ***All documentation for Category VI Needs must be reviewed and approved by EPA prior to its acceptance.*** To assist States in collecting appropriate storm water documentation, a suggested documentation form is provided as Figure 5-1. ***The State Storm Water Control Needs Survey Form may be photocopied and used as the cover sheet for the submission of all Category VI Needs.***

In general, operation and maintenance costs for improved storm water control are not eligible as needs; however, some program implementation costs might be eligible. In addition, comparable construction costs may be used to update cost estimates. As indicated in Table 5-3, the costs of structural storm water controls can vary widely based on the type of control, capacity served, and other factors, such as unique geological features. ***When developing costs of comparable construction estimates, a State should collect and analyze information from storm water control facilities that are typical of the conditions found in that State.*** The data in Table 5-3 are only examples and are not to be used for cost purposes.

The final rule for Phase II storm water discharges was published in the *Federal Register* on December 8, 1999. Phase II storm water dischargers consist of commercial, retail, light industrial and institutional facilities, construction activities of less than 5 acres in size, and municipal separate storm sewer systems serving populations of less than 100,000. The regulation provides application deadlines in two tiers. The first tier allows NPDES permitting authorities to target dischargers that are contributing to a water quality impairment or are significant contributors of pollutants to waters of the United States (are named by the permitting authority or identified in 305(b) water quality inventory reports). The second tier Phase II storm water sources are important because they must be integrated into EPA's broad approach for addressing wet weather flows, as well as being considered Category VI Needs. It should be noted that Phase II storm water dischargers are not required to have NPDES storm water permits until March 10, 2003. Documentation must include evidence that the municipality was named by an NPDES authority or has been identified in the 305(b) report or some other study indicating use degradation caused by the Phase II storm water discharge. Other Phase II storm water dischargers can be considered urban nonpoint sources and might be eligible for SRF under the CWNS 2000 Category VII Needs if the needs can be documented. States can also develop cost of comparable construction estimates for these needs.

Figure 5-1. State Storm Water Control Needs Survey Form

State Storm Water Control Needs Survey Form

(1) Community name and address

2) Representative providing information

(3) Kind of utility (e.g., municipality, regional treatment authority, storm water utility)

(4) Description of available storm water control planning documents

(5) Project description (describe what will be constructed; e.g., storm sewers, detention systems, etc.). Include name of receiving water. If more than one project, use additional sheets.

(6) Anticipated year that project will be started and completed

(7) Specify project goals (e.g., surface water quality protection; ground water quality protection; erosion control; flood control; other)

Figure 5-1. (Continued)

(8) Estimated project cost (be specific)

Storm sewers or channels

Pumping facilities

Exfiltration trenches or swales

Underdrains

Other

(9) Population served by project (include census year)

(10) Area served by project

(11) Attach documentation

(12) Signature of authorized representative

(13) Signature of qualified State project staff

Table 5-3. Examples of the Range of Capital Costs for Urban Storm Water Control Measures

Type of Control	Cost Estimates Low	Moderate	High
1-acre wet detention basin	$37,599	$71,883	$106,161
5-acre wet detention basin	$187,926	$341,848	$495,803
3-foot deep, 4-foot-wide infiltration trench	$2,691	$5,029	$7,367
1-acre porous pavement parking lot	$40,051	$59,169	$78,288
3-foot deep, 21 foot wide grassed swale	$12,909	$23,156	$33,404
100-foot wide grassed filter strips	$32,496	$57,205	$81,914
1.5-foot diversion swale	$202	$414	$625
3-foot deep sediment trap	$397	$797	$1,198
3-foot deep sediment trap	$349	$602	$854
0.1-acre sediment basin	$4,782	$10,465	$16,149
0.25-acre sediment basin	$8,133	$16,408	$24,684
1-acre sediment basin	$26,464	$48,929	$71,395

Source: *Cost of Urban Nonpoint Source Water Pollution Control Measures*, Southeastern Wisconsin Region Planning Commission, 1991.

SANITARY SEWER OVERFLOWS

Background

Sanitary Sewer Overflows (SSOs) are raw sewage discharges that occur before sewage reaches a treatment facility. SSOs can release untreated sewage into basements, streets, or streams before it can be processed and rendered safe to discharge into receiving waters. SSOs are often the result of poor maintenance or insufficient capacity of sewer system facilities. Severe wet weather events can also overwhelm sewer systems and cause SSOs.

Sewers overflow because of a variety of system-specific failures and combinations of failures. Over time, sewer pipes can be damaged by tree roots, settling, cracking, or shifting. Sediment, roots, and grease buildup in pipes can cause blockages. These blockages and damages can lead to system failures and SSOs. Damaged or deteriorating sewer pipes also allow unintended infiltration and inflow (I&I) of precipitation into the sanitary sewer system. During wet weather, I&I can increase total flow to the point it overwhelms the capacity of a collection or treatment facility, causing an SSO. Structural, mechanical, or electrical failures leading to SSOs can also be caused by wet weather. EPA estimates that wet weather peak flows caused by I&I range from 3.5 to 20 times average dry weather flows. Similarly, undersized sewer systems can be overwhelmed by excess sewage from new developments being connected to old collection systems. In many cases, SSOs are the result of a problem at the point of connection between a private sewer line and a public system or the private sewers themselves.

SSOs can threaten public health because raw sewage contains harmful pathogens such as viruses, bacteria, protozoa, intestinal worms, fungi, and molds. Diseases associated with raw sewage include cholera, hepatitis, Legionnaire's disease, dysentery, gastroenteritis, and many other illnesses. After an SSO, people can become sick from drinking water contaminated with raw sewage, making contact with untreated sewage while swimming, breathing raw sewage aerosols, or eating shellfish contaminated by raw sewage. SSOs also damage property, especially in building basements. Items like furniture and carpet must be discarded after saturation with raw sewage. Environmental damage to receiving waterbodies is also a problem associated with SSOs. Raw sewage discharge can impair designated uses such as drinking water and recreation. SSOs can also close beaches and restrict fishing and shellfish harvest in affected areas.

Identifying Appropriate Needs Categories for Projects Addressing SSOs

There is limited information concerning the frequency and magnitude of SSOs. Wet weather events appear to be linked to many sewer overflows. Broken, clogged, or poorly maintained sewer pipes also contribute to many reported SSOs. Sewer overflows can be reduced and eliminated by appropriate cleaning and maintenance, reducing I&I, enlarging sewer system capacity, improving system reliability, and addressing SSO issues when planning new systems. Making improvements to sewer systems can be very expensive. The cost to replace a single large municipal sewer system is estimated to be in the billion dollar range. Smaller systems can cost many millions of dollars. Funding assistance for sewer system rehabilitation to reduce SSOs is available through the SRF. Given the common relationship to I&I, many SSOs will be attributable to Category IIIA. However, solutions to problems causing some SSOs might be addressed by Categories I, IIIB, and IVA-B. The major SSO focus for CWNS 2000 will be documentation of appropriate needs categories based on existing natures.

SSO Regulatory Status and Framework

The Sanitary Sewer Overflow Subcommittee of the Urban Wet Weather Flows Federal Advisory Committee is composed of representatives from states, municipalities, health agencies, and environmental advocacy groups. EPA convened this group of people to advise the EPA on how to best reduce SSOs with a nationally consistent approach to permitting and enforcement. EPA's forthcoming proposed rule will require NPDES permits for POTWs to encompass their sanitary sewer collection systems and will add a provision for new permits to be issued for satellite sewer collection systems (municipal collection systems for which no POTW is included). Specifically, the proposed rule establishes the following:

- **A Prohibition on Municipal Sanitary Sewer System Discharges.** Prohibits municipal sanitary sewer discharges that occur prior to a publicly owned treatment works (POTW). Exceptions to this rule are allowed in the case of severe natural conditions such as hurricanes and earthquakes, or if the discharge was caused by factors beyond the reasonable control of the NPDES permittee.

- **Satellite Collection**. This short permit provision defines as a “satellite” any publicly owned sewer collection system that discharges into another sewer system served by an NPDES permitted treatment works that is owned by someone else. Under the new rule, satellite systems would have the duty to apply for their own NPDES permits.

- **Record Keeping and Public Notification.** In the case of an SSO, municipal sanitary sewer systems would have to keep records of the time, location, volume, and cause of an overflow. Sewer system personnel would be required to report SSOs to NPDES authorities. They would also be required to immediately inform the public of sewage overflows that endanger human health.

- **Peak Excess Flow Treatment Facilities (PEFTF).** Facilities wanting or needing PEFTFs would be prioritized by need and encouraged to do a system assessment and make specific plans to fix causes of SSOs. If repairs to the existing sewer system are not sufficient to halt SSOs, or if repairs cannot be carried out in a timely manner, new PEFTFs might be allowed through an administrative order or consent decree on a case-by-case basis, with the intent that they would be phased out eventually.

- **Watershed-based Planning**. This provision puts the new SSO rule in the same framework as other EPA initiatives such as EPA’s *NPDES Watershed Strategy* (March 1994) and the 1998 *Clean Water Action Plan.* Watershed approaches are thought to be the best way to coordinate regulatory activities to most effectively protect a specific waterway.

- **Capacity, Management, Operation and Maintenance (CMOM).** This provision sets standards for the proper operation and maintenance of sanitary sewer systems. The CMOM provisions also include standards for management that establish criteria for effective communication and record keeping practices to reinforce operation and maintenance efforts. The proposed rule sets forth six major program components for CMOM implementation.

  — The CMOM program requires that permittees meet **general standards** for management of sewage systems. Permittees must manage and maintain their facilities, provide adequate capacity to process peak flows, take all feasible steps to stop SSOs, and inform the public when SSOs occur.

— Permittees must develop and implement their own CMOM **management program** to comply with CMOM general standards provisions. CMOM management includes goal setting and organizing personnel to implement CMOM. CMOM also requires the permittees to use their legal authority to maintain sewers and reduce I&I. Permittees should also maintain a map of the sewage collection system and keep an inventory of system equipment and spare parts. Permittees should eliminate sewage overflows into sensitive waters. Other important provisions include monitoring the effectiveness of the CMOM management program and making appropriate system changes in response to monitoring results.

— Permittees must also have an **overflow emergency response plan** to protect public health, inform public health authorities, and investigate the cause of SSOs.

— **System evaluation** and **capacity assurance** plans are necessary to address hydraulic deficiencies and estimate system capacity during peak flows.

— **CMOM program audits** are probably the most important part of the CMOM provisions. Permittees carry out self-audits to identify maintenance and capital improvements needs.

— Lastly, the CMOM provisions outline the need for permittees to establish lines of **communication** with various interested parties concerning the CMOM program and to allow comment from outside parties.